Stoller
Hanford Office

DOE-EM/GJ632-2004

C4471
Log Data Report

Borehole Information:

Borehole: C4471			**Site:** 100 N Area		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 15.4		**GWL Date:**	03/23/2004
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
Not Available	Not Available	March 2004	Not Available	24	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded steel	2.6	8 5/8	7 5/8	0.5	0.0	24
The driller supplied the casing measurements.						

Borehole Notes:

This borehole is located approximately 40 ft from the Columbia River. Zero reference is the ground surface.

Logging Equipment Information:

Logging System:	Gamma 2A		**Type:**	SGLS (35%) 34TP20893A
Calibration Date:	03/2004	**Calibration Reference:**	GJO-2004-593-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 / Repeat		
Date	03/23/03	03/23/03	03/23/03		
Logging Engineer	Pearson	Pearson	Pearson		
Start Depth (ft)	20.73	20.0	10.0		
Finish Depth (ft)	20.73	0.0	9.0		
Count Time (sec)	200	200	200		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	N/A[3]	1.0	1.0		
ft/min	N/A	N/A	N/A		
Pre-Verification	BA318CAB	BA318CAB	BA318CAB		
Start File	BA318000	BA318001	BA318022		
Finish File	BA318000	BA318021	BA318023		
Post-Verification	BA318CAA	BA318CAA	BA318CAA		
Depth Return	N/A	¼ low	¼ low		

Log Run	1	2	3 / Repeat		
Error (in.)					
Comments	Collected at the bottom of the borehole.	No gain adjustments were made.	Repeat section.		

Logging Operation Notes:

Zero reference was ground surface. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 82.

Analysis Notes:

Analyst:	Sobczyk	Date:	3/24/04	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day. All of the verification spectra were within the acceptance criteria. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 1.0 percent higher and 6.8 percent higher at the end of the day. Examinations of spectra indicate that the detector functioned normally during logging, and the spectra are accepted.

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The post-run verification spectrum was used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2AFeb04.xls). Zero reference was the ground surface. Based on the field measurements, the casing configuration was assumed as one string of 8-in. casing with a thickness of ½ in. to 20.73 ft (total logging depth). The dead time correction was not required. A water correction was applied below 15.4 ft.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{60}Co was the only man-made radionuclide detected in this borehole. ^{60}Co, based on the 1173-keV photopeak, was detected in the interval between 8 and 9 ft at concentrations near the MDL (0.1 pCi/g). ^{60}Co, based on the 1333-keV photopeak, was detected at the very bottom of the borehole (20.73 ft) with a concentration of 0.3 pCi/g. Confirming photopeaks for ^{60}Co were apparent at 8, 9, and 20.73 ft. However, the APTEC software did not identify these photopeaks as being statistically significant.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides at energy levels of 609, 1461, 1764, and 2614 keV. ^{137}Cs was also detected at 39.5 ft on the repeat log run at a concentration near the MDL (0.2 pCi/g). The ^{60}Co (1173 keV) detected at 9 ft on the original log run did not repeat because it is near the MDL.

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[1] GWL – groundwater level
[2] TOC – top of casing
[3] N/A – not applicable

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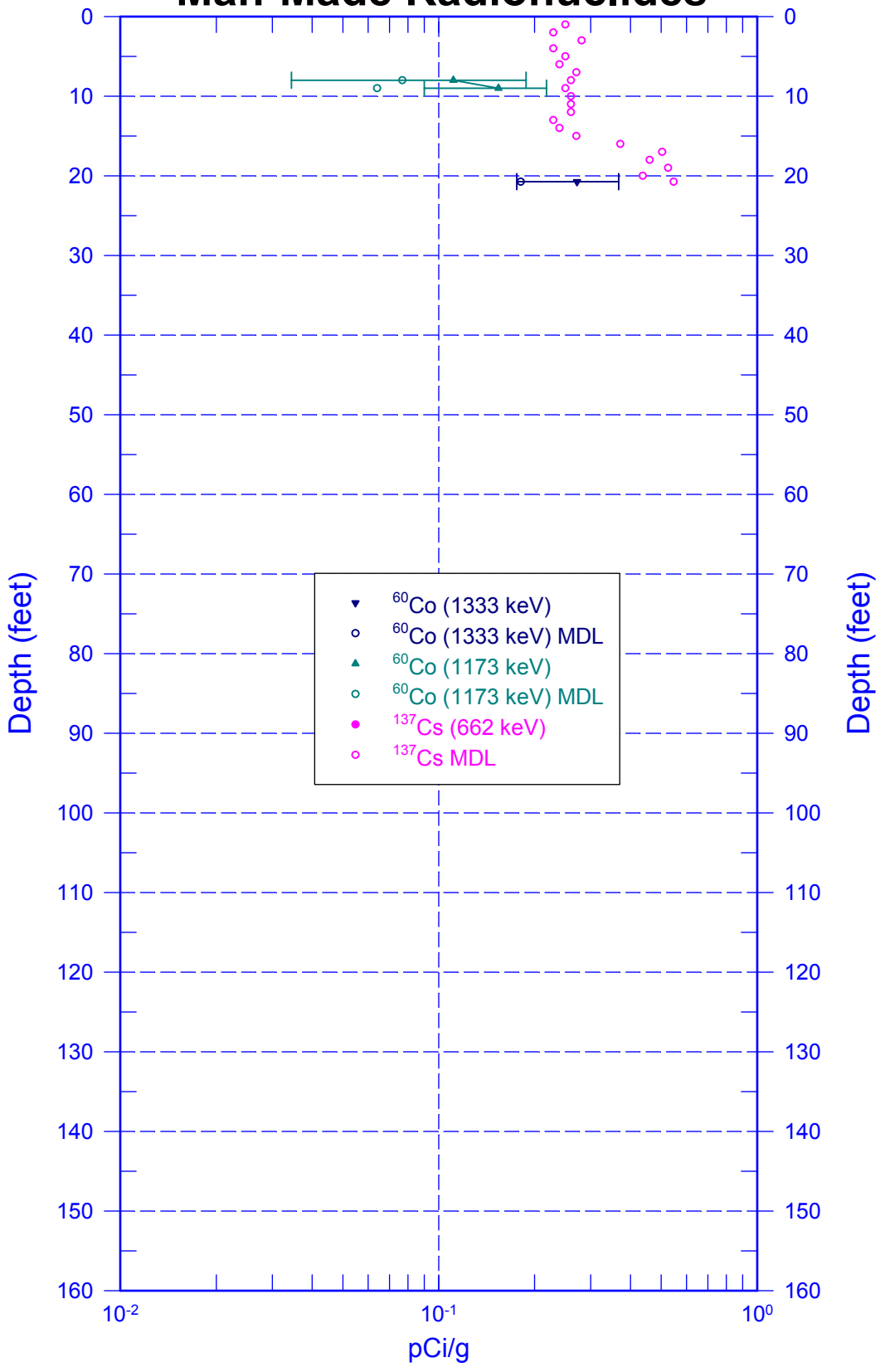
Man-Made Radionuclides



Zero Reference = Ground Surface

Date of Last Logging Run
3/23/2004

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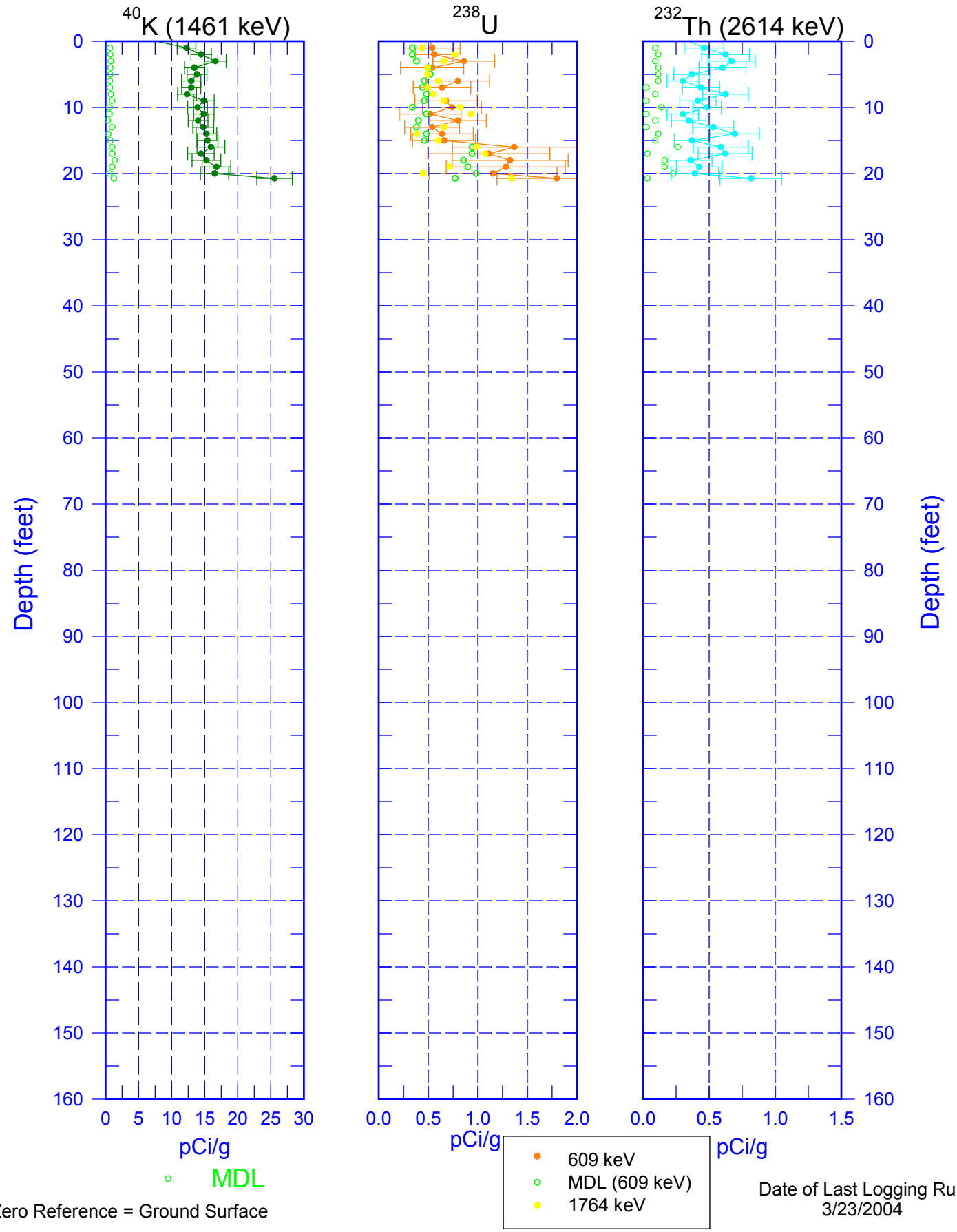
Natural Gamma Logs



Zero Reference = Ground Surface

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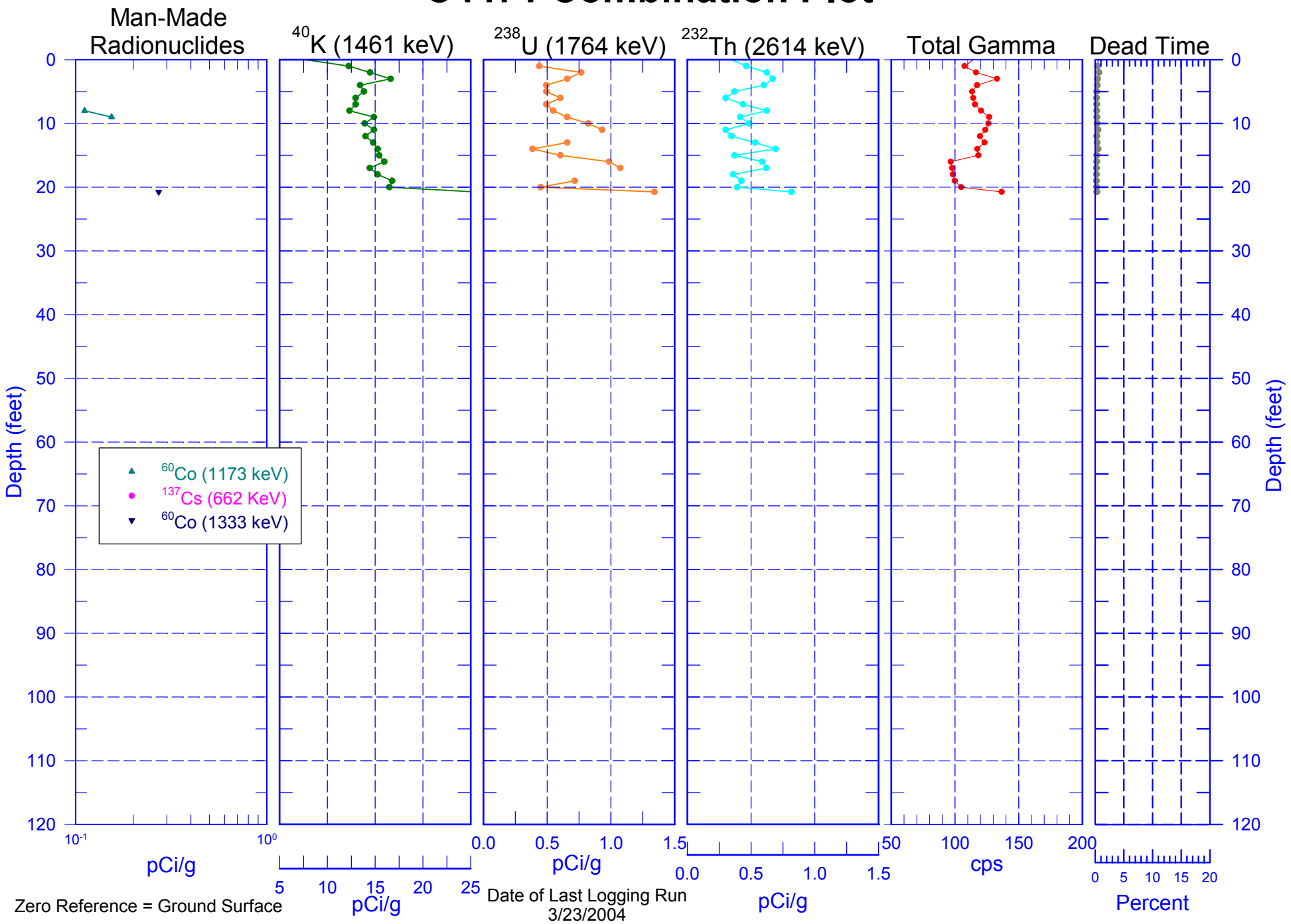
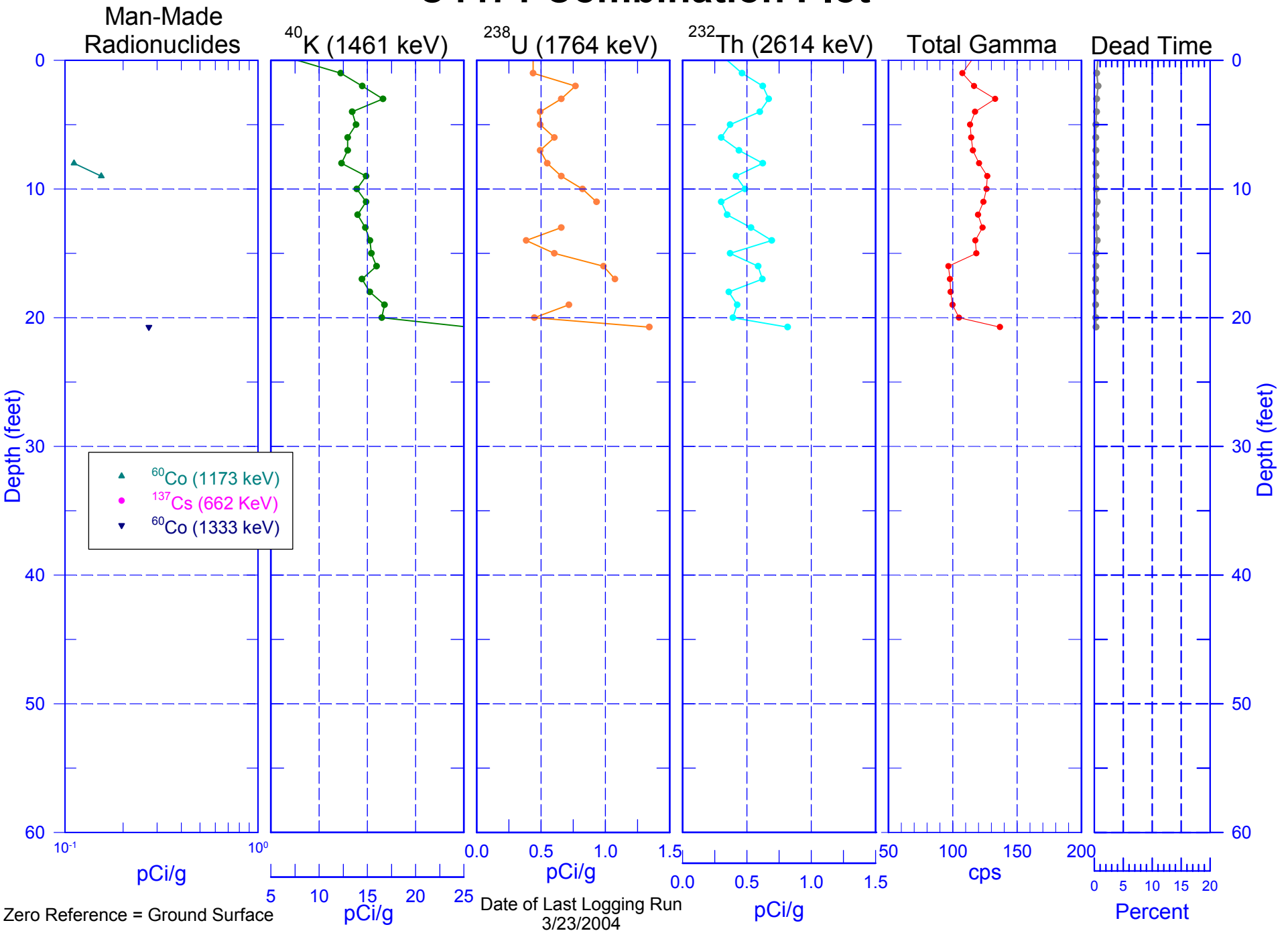
3/23/2004

C4471 Combination Plot



C4471 Combination Plot



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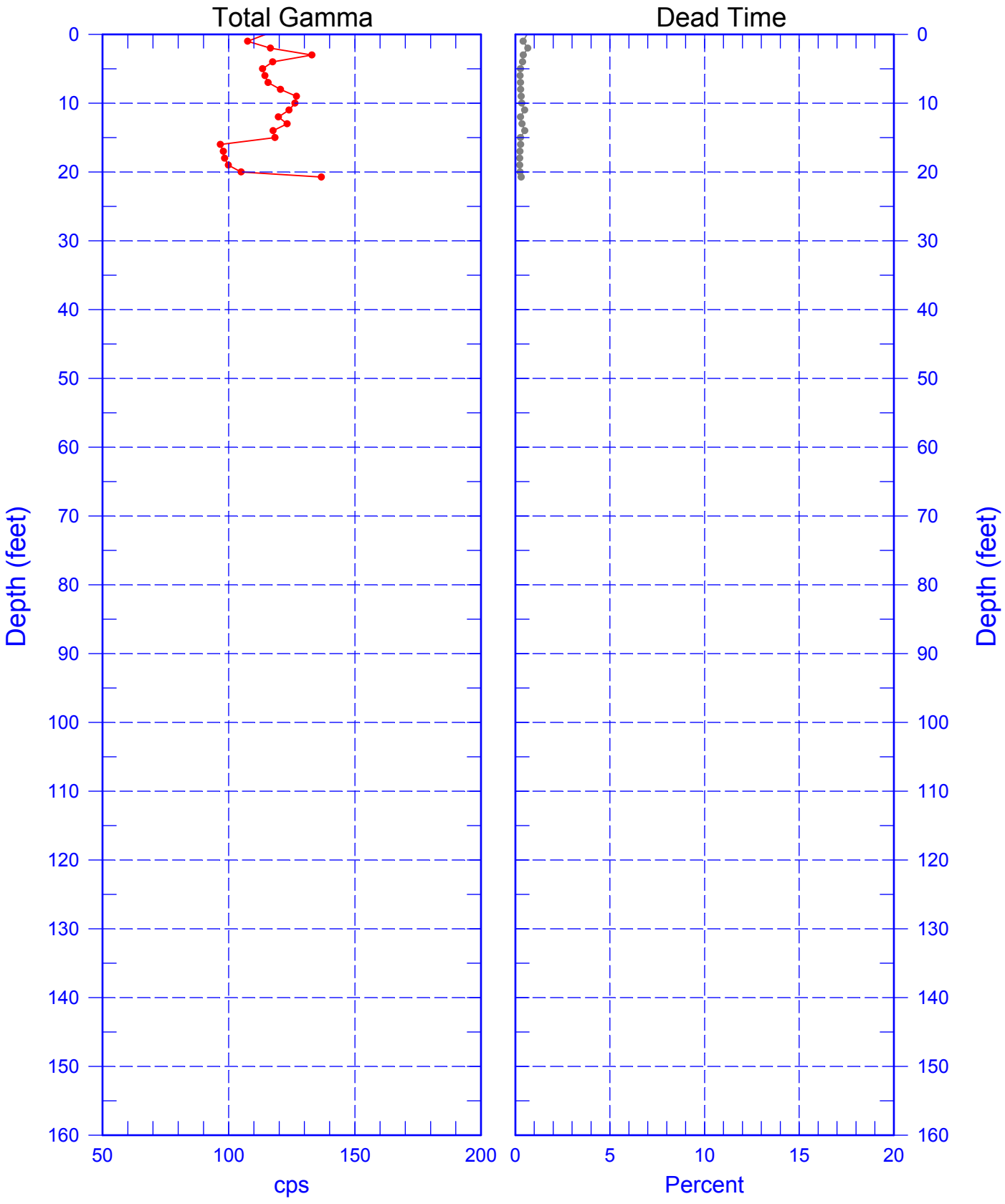
Total Gamma & Dead Time



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Rerun of Natural Gamma Logs (10.0 to 9.0 ft)